

Application of cactus line in reducing and control run off in a small watershed situated in the north west of Algiers (Mediterranean climate)

¹Kessaissia, A. – Mahieddine, M. – Hamoudi, A. – Laribi, G.

¹Chargé d'étude à la Station de l'INRF de TENES. Tel: 213 068979612; E-mail: akessaissiaz@yahoo.fr

Abstract

An experience was done to try the effect of the line of cactus plant in reducing the velocity and the concentration of the runoff and its capacity in shearing and currying out the soil from rill channel.

This experience was done in area situated in a small watershed in Mediterranean climate and in witch run off cause a serious kind of channel erosion; sheet, rill

The area is situated in the west of Algiers (in the south of the Mediterranean), it's characterized by loam soil, semi arid climate with 400 mm average rainfall and a slope bigger then 10 %.

The transplantation was done in January 2000 by 10 meter length from the top to the bottom of the area and a 20 meter space between lines. The effect of the line was done by following and comparison the variation of channel dimension about 20 meter length and average large about 0.15 meter in area treated by line with an other channel with similar characteristics but without line of agave .

The result after three years shows that the shearing action is important in area without line. The volume of the channel computed by Surfer logiciel varied from 23511 cm³ (2001), 153445 cm³ (2002) and 63397 cm³ against 28511cm³ (2001) , 70917 (2002) and 20608 cm³.

The difference shows the role of the line of plant in reducing the volume of soil cutting by runoff. This can be attributed to the effect of line in reduction of the velocity, volume and energy of water in the channel.

Key words: erosion, Channel, erosion control, line of cactus .

Introduction

The soil in mountain area is severely exposed to water erosion especially when it wasn't protected. The phenomena can reach the critical form characterized by crust surface, decrease infiltration and quickly run off concentration. The last one can do considerable damage. In the up stream can affect the losing a great soil surface and organic mater and in the down stream by destruction of the water quality, soil inundation and dam sedimentation.

To prove solution to reduce the risk of erosion is necessary. There are different methods witch are tested around the world (Roose, 1977, Auzet, 1989 and Hay & al 1984). They have demonstrated the role of the different system in reducing erosion and in protect soil from the erosion risk.

Simple methods like stones line, hedges or plant line can reduce the speed and the volume of run of in side the rill and in area between rill and can holdup speed of run off below 25cm/h (speed required to remove soil from the rill (Haljustum ,1935).

Search done in the tropical area shown that this measure carry long to keep the sediment, increase infiltration and decrease the slope (Teffer,1983, Thomas , 1988 and Roose, 1977).

In this study we test of cactus line in reducing the effect of runoff in power to remove soil from rill and to examine this effect tow rill were followed one situated in the middle of area in witch are installed the cactus line and in another one without cactus line. Data in three dimensions of rills was analyzed by Surfer logical .

Methods

- Selection of two area about the same characteristic; slope, soil, climate, vegetation, cultural practices. The first one we have installed a cactus line from the up of the area to the down by 10meter length and 20 meter space between lines. The second area is let without cactus line.
- Follow two rill one in first area and another in the second about 10 meter length, 15 cm deep and 20 cm large.
- Analyze the data in three dimensions about the rill.

Results

Analyze of data about the two rills is shown in table 1,2 and 3 and figure 1 show the variation of the rill volume without cactus line is very significant then rill situated in area with line.

Table 1 Rill volume m³ of area treated by cactus line

rule of calcul	initial volume	Volume in m ³ 2001	Volume in m ³ 2002	Volume in m ³ 2003
Trapezoidal	0.152335	0.176367	0.234553	0.252214
Simpson 2/3	0.153256	0.175353	0.233413	0.256412
Simpson	0.152368	0.176730	0.234277	0.255612
Average volume	0.152653	0.176164	0.234081	0.254749

Table 2 Rill volume m³ of area without cactus line

Rule of calcul	initial volume	Volume in m ³ 2001	Volume in m ³ 2002	Volume in m ³ 2003
Trapezoidal	0.153255	0.191792	0.341233	0.401441
Simpson 2/3	0.155522	0.189700	0.342112	0.412536
Simpson	0.155650	0.191832	0.344450	0.415879
average	0.154809	0.191108	0.344555	0.409952

Table 3 Soil volume removed from the rill (m³)

years	Volume of soil removed from area without cactus line	Volume of soil removed from area with cactus line
2001-2002	0.153445	0.057917
2002-2003	0.038299	0.023511
2003-2004	0.063397	0.020668
Total	0.255141	0.102096

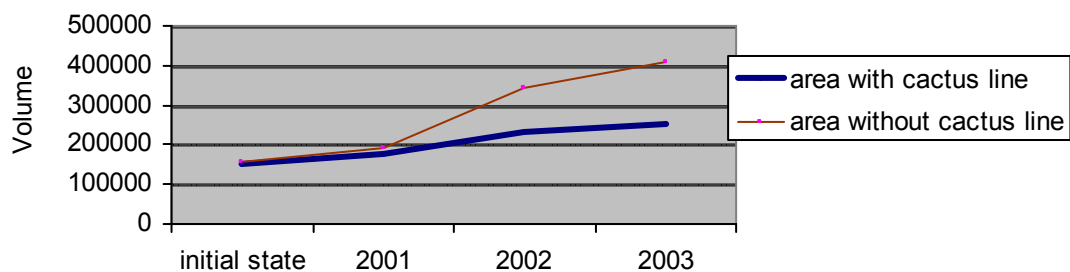


Figure 1 Yearly variation volume in the two rills (cm³)

The final volume estimated in three years is equivalent to 0.255141 m³(71%) successively equal to 0.0153445 m³ in 2001, 0.038299 m³ in 2002 and 0.063397 m³ in 2003. however in the treated area by the cactus line final volume equal to 0.102096 m³(29%) in succession equal to 0.057917 m³ in 2001, 0.023511 m³ in 2002 and 0.020668 in 2003.

Monthly analyze show that sharing soil is very important in November and December when the rainfall is very serious, figure 2 and 3.

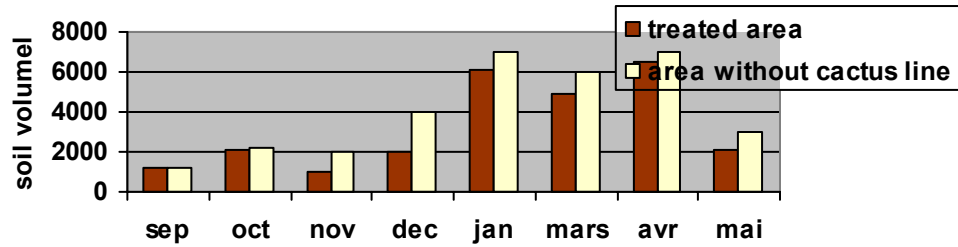


Figure 2 Volume du sol décapé en cm³ enregistré en 2002-2003

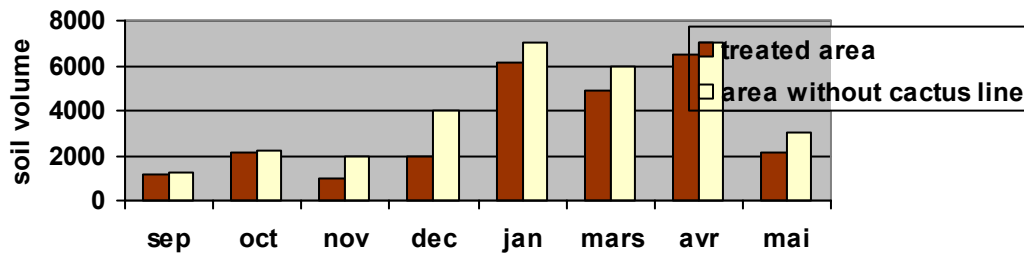


Figure 3 Soil volume detached in cm³ registreted in 2002-2003

The results show that the forms of the variation are most important in the rill situated in area without cactus line. The distinction shows the effect of line in reducing the runoff action by reducing volume and the volume and by increasing infiltration.



Figure 4 Cactus installed to reduce the evolution of rill and increase infiltration

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